

Origin of the Power of the Pile

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rent is only another form of the forces of chemical affinity; that its power is in proportion to the chemical affinities producing it; that when it is deficient in force it may be helped by calling in chemical aid,, the want in the former being made up by an equivalent of the latter; that,, in other words, *the fortes termed chemical affinity and electricity are one and the same.*

654. When the circumstances connected with the production of electricity in the ordinary voltaic circuit are examined and compared,, it appears that the source of that agent., always meaning the electricity which circulates and completes the current in the voltaic apparatus, and gives that apparatus power and character (682, 732), exists in the chemical action which takes place directly between the metal and the body with which it combines, and not at all in the subsequent action of the substance so produced with the acid present.¹ Thus, when zinc,, platina, and dilute sulphuric acid are used, it is the union of the zinc with the oxygen of the water which determines the current; and though the acid is essential to the removal of the oxide so formed, in order that another portion of zinc may act on another portion of water, it does not, by combination with that oxide, produce any sensible portion of the current of electricity which circulates; for the quantity of electricity is dependent upon the quantity of zinc oxidised., and in definite proportion to it: its intensity is in proportion to the intensity of the chemical affinity of the zinc for the oxygen under the circumstances, and is scarcely, if at all, affected by the use of either strong or weak acid (643).

655. Again, if zinc, platina, and muriatic acid are used, the electricity appears to be dependent upon the affinity of the zinc for the chlorine, and to be circulated in exact proportion to the number of particles of zinc and chlorine which unite, being in fact an equivalent to them.

656. But in considering this oxidation, or other direct action upon the METAL itself, as the cause and source of the electric current, it is of the utmost importance to observe that the oxygen or other body must be in a peculiar condition, namely, in the state of *combination* ; and not only so., but

limited still
further to such a state of combination and in such
proportions
as will constitute an *electrolyte* (558). A pair of
zinc and platina
plates cannot be so arranged in oxygen gas as
to produce a
current of electricity, or act as a voltaic circle,
even though the

¹ Wollaston, *Philosophical Transactions*, 1801, p.
427.